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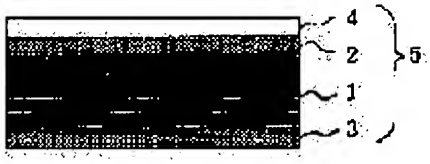
(54) CONDUCTOR FOR HYBRID INTEGRATED CIRCUIT SUBSTRATE

(57)Abstract:

PURPOSE: To suppress the generation of side etching by a method wherein, between the Cu foil and Al foil constituting a double-layer foil which forms the conductor part of a hybrid integrated circuit, the thickness of the Al foil is controlled, and water-soluble resin, which dissolves in a specific pH alkaline aqueous solution, is formed on the surface of the Al foil.

CONSTITUTION: On the conductive part 5 where Cu and Al laminated sheets of foil are formed in the order of Al, Cu and Al using Cu foil of 9 to 1000μm in thickness, Al foil of 0.5 to 30μm in thickness and water soluble resin 4 which easily dissolves in an alkaline aqueous solution of pH 8 or higher.



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JAPANESE [JP,08-124958,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS OPERATION DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] the conductor which becomes a metal substrate from an insulating material layer and the double layer foil of Cu and aluminum -- this foil of the laminated material which carries out the laminating of the section one by one, and it comes to unify In the hybrid integrated circuit which etches, is made to form a wiring circuit, and carries out the laminating of Cu circuit, and a semi-conductor and other members to aluminum circuit and Cu circuit which were exposed through solder, and fixes a semi-conductor and aluminum circuit using aluminum lead wire the conductor which the double layer foil of Cu and aluminum formed in order of aluminum/Cu/aluminum -- in the section The thickness of Cu foil in the range whose thickness of 9-1000 micrometers and aluminum foil is 0.5-30 micrometers the object for hybrid integrated circuit substrates excellent in aluminum wire-bonding nature characterized by forming 0.5-10 micrometers of water-soluble resin which dissolves in aluminum foil front-faces [one of] side easily to a with a pH of eight or more alkaline water solution by desiccation thickness -- a conductor.

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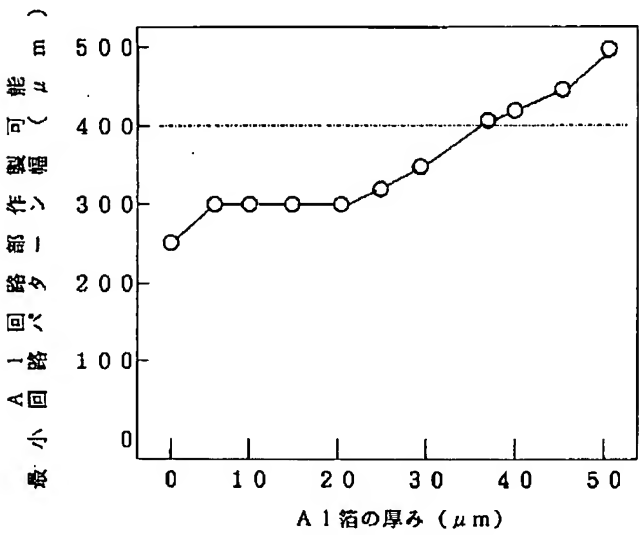
Drawing selection Representative drawing



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] the object for hybrid integrated circuit substrates this invention excelled [object] in aluminum wire bonding and high-density-assembly nature -- it is related with a conductor.
[0002]
[Description of the Prior Art] In order to have manufactured conventionally the substrate which has the function of wire bonding, circuit formation needed to be performed using Cu foil, and base-metal plating, such as noble-metals plating or nickel, needed to be performed on the circuit, or the piece of a metal in which wire bonding, such as a piece of aluminum, is possible needed to be joined on Cu foil.
[0003] However, it is difficult for noble-metals plating or nickel plating it to be not only expensive, but to acquire a uniform plating side, and the wire-bonding engine performance is unstable. Moreover, in junction of the piece of a metal, when numerous, there was a problem that a circuit formation activity became complicated.
[0004] On the other hand, as a new approach, the approach of forming the circuit of aluminum by etching has been used using the substrate which made the double layer foil of aluminum and Cu rival so that JP,58-48432,A may see. The description of the bonding pad of this aluminum should not have the need for plating in the middle of (1) process.
(2) It is not necessary to manage the precision and thickness on the front face of plating like the bonding pad by plating.
(3) By etching, repeatability is good and many aluminum circuits can be formed at once.
(4) Since it becomes association with aluminum and aluminum in the ultrasonic bonding by aluminum line, the activity range of bonding is wide and it is reliable.
** is mentioned.
[0005]
[Problem(s) to be Solved by the Invention] However, if a minute defective part also exists in aluminum foil section since aluminum foil section also contacts an etching reagent at the time of etching of Cu foil when a circuit is formed with the double layer foil of aluminum and Cu according to said circuit forming method, localized corrosion will occur there and even lower layer Cu foil will be etched through aluminum foil. Consequently, the problem that neither outstanding aluminum wire-bonding nature nor smooth Cu circuit is obtained arises. If it is going to correspond the defect of this aluminum foil section by the thickness of aluminum foil, in case aluminum circuit will be formed with alkali etching liquid, side etching becomes intense and it becomes difficult to form aluminum circuit suitable for high density assembly.
[0006] In the future, further, high integration and high density assembly are required and, as for a printed-circuit board, the conductive foil which can form a smaller conductor width and conductor spacing will be needed for a circuit. Therefore, it is required that aluminum foil should suppress generating of side etching using the thinnest possible thing, and etching of aluminum foil section by contact of Cu etching reagent should also be suppressed.

[0007] the object for hybrid integrated circuit substrates which was excellent in aluminum wire-bonding nature also by the conventional circuit formation approach, and made high density assembly possible as a result of inquiring wholeheartedly, in order that this invention may solve such a trouble -- a conductor is offered.
[0008]
[Means for Solving the Problem] the conductor which becomes a metal substrate from an insulating material layer and the double layer foil of Cu and aluminum according to this invention -- this foil of the laminated material which carries out the laminating of the section one by one, and it comes to unify In the hybrid integrated circuit which etches, is made to form a wiring circuit, and carries out the laminating of Cu circuit, and a semi-conductor and other members to aluminum circuit and Cu circuit which were exposed through solder, and fixes a semi-conductor and aluminum circuit using aluminum lead wire the conductor which the double layer foil of Cu and aluminum formed in order of aluminum/Cu/aluminum -- in the section The thickness of Cu foil in the range whose thickness of 9-1000 micrometers and aluminum foil is 0.5-30 micrometers the object for hybrid integrated circuit substrates excellent in aluminum wire-bonding nature characterized by forming 0.5-10 micrometers of water-soluble resin which dissolves in aluminum foil front-faces [one of] side easily to a with a pH of eight or more alkaline water solution by desiccation thickness -- a conductor is offered.
[0009]
[Function] Hereafter, a drawing explains this invention to a detail. the conductor in the hybrid integrated circuit substrate with which drawing 1 was produced by this invention -- the sectional view of the section is shown. the double layer foil with aluminum foil to both sides of the Cu foil 1 -- a conductor -- it is the section 5, and the laminating of the water-soluble resin 4 which dissolves easily to a with a pH of eight or more alkaline water solution is carried out, on the insulating material layer 7, the laminating of the aluminum foil 3 side of another side is carried out, and it is used for the front face of the aluminum foil 2 of the side which forms a circuit.
[0010] drawing 2 -- the conductor of this invention given in drawing 1 -- it is a sectional view although the substrate for circuit formation was actually produced using the section 5. aluminum plate -- the base substrate 6 -- the resin of the insulating material layer 7 -- a laminating -- carrying out -- a it top -- a conductor -- the laminating of the section 5 is carried out. this time -- the aluminum foil 3 of the front face of the Cu foil 1 of circuit formation and the opposite side -- a conductor -- if it is in order to raise the bonding strength of the section 5 and the insulating material layer 7, and there are 0.5 micrometers or more of thickness, it will come out enough. And it is further effective if aluminum oxidizing zone by anodizing is given to aluminum foil 3 front face. however -- if water-soluble resin 4 is shown in aluminum foil 3 front face -- a conductor -- since the bonding strength of the section 5 and the insulating material layer 7 is not obtained, formation of water-soluble resin 4 requires only one side.
[0011] the conductor which is the double layer foil of the Cu foil 1 and the aluminum foil 2 which are used for this invention -- as the quality of the material of the section 5 -- aluminum and Cu -- the thing of a high grade -- the thing of an alloy -- any are sufficient. a conductor -- what there is the sticking-by-pressure clad method of aluminum and Cu, an electric aluminum galvanizing method which used Cu as the galvanized body, or the vacuum evaporationo aluminum galvanizing method as the production approach of the section 5, and was created by which approach may be used.
[0012] the conductor of this invention -- 9-1000 micrometers is applicability, the thickness of the Cu foil 1 in the section 5 has desirable 35-1000 micrometers for especially a high current application, and its foil thickness of 9-70 micrometers is desirable for the small current application for control.
[0013] the conductor with which drawing 3 formed aluminum foil with a thickness of 5 micrometers in both sides of the Cu foil 1 with a thickness of 300 micrometers -- the desiccation thickness of the water-soluble resin 4 applied to the front face of the aluminum foil 2 when forming a circuit according to the conventional circuit forming method after making the section 5 rival in the base substrate 6 and the insulating material layer 7, and a conductor -- the corrosion resistance over Cu etching reagent of the aluminum foil 2 is investigated among the sections. If it applies so that it may be set to 0.5 micrometers or more by making the water-soluble resin 4 of aluminum foil 2 front face into desiccation thickness, the

corrosion resistance of the aluminum foil 2 to Cu etching reagent will improve. Moreover, when the thickness of water-soluble resin 4 becomes thick, the fall of aluminum wire-bonding nature can be considered, but by such circuit formation, before giving aluminum wire bonding, in order to give alkaline degreasing or buffing for the purpose of washing on the formed circuit, there is also no un-arranging according to the resin thickness to apply, and, originally especially an upper limit is not specified. However, considering economical effectiveness, 0.5-10 micrometers is enough as the desiccation thickness of water-soluble resin 4.

[0014] Since to dissolve with aluminum promptly is demanded in case the dissolution by contact of general life water, such as acid Cu etching reagent and storm sewage, and tap water, etc. can be avoided as water-soluble resin used for this invention and aluminum circuit is formed with an alkaline etching reagent, pH must be water-soluble resin which dissolves only in eight or more alkali water solutions.

[0015] the conductor with which drawing 4 formed aluminum foil in Cu foil 1 both sides with a thickness of 300 micrometers in the range with a thickness of 0.1-50 micrometers -- with the thickness of aluminum foil when forming a circuit according to the conventional circuit forming method, after making the section 5 rival in the base substrate 6 and the insulating material layer 7 The result which formed in the front face of the aluminum foil 2 1 micrometer by having made water-soluble resin 4 into desiccation thickness, and was investigated about the relation between the minimum circuit pattern width of face which can produce the aluminum circuit 8, and the minimum circuit pattern spacing is shown. In addition, the minimum circuit pattern width of face and the minimum circuit pattern spacing serve as a standard of high-density-assembly-izing in a printed circuit, and its conventional minimum circuit pattern width of face [in the double layer foil of aluminum and Cu] which can create the aluminum circuit 8 and conventional minimum circuit pattern spacing were larger than 400 micrometers. Moreover, since the value almost equivalent also to the minimum circuit pattern width of face and the minimum circuit pattern spacing was shown here, only the minimum circuit pattern width of face is shown.

[0016] If the thickness of the aluminum foil 2 exceeds 30 micrometers so that drawing 4 may show, the minimum circuit pattern width of face which can produce the aluminum circuit 8 cannot be set to 400 micrometers or less. Moreover, even if it forms water-soluble resin 4, the aluminum circuit 8 which has good aluminum wire-bonding nature as the thickness of the aluminum foil 2 is less than 0.5 micrometers cannot be obtained. Therefore, in order to set the producible minimum circuit pattern width of face to 400 micrometers or less and to realize high-density-assembly-ization, 0.5 micrometers or more of water-soluble resin which dissolves in a with a pH of eight or more alkali water solution are formed in the front face of the aluminum foil 2 by desiccation thickness, and, as for the thickness of the aluminum foil 2, it is desirable to make it 0.5-30 micrometers.

[0017]

[Example 1] Hereafter, an example explains this invention to a detail. First, aluminum plating with a thickness of 5 micrometers was performed to both sides of the rolling Cu foil 1 with a thickness of 300 micrometers with electroplating, and the double layer foil of aluminum and Cu was produced. on aluminum foil 2 front face used for the circuit formation side of this double layer foil, the acid number becomes 1 micrometer by using the acrylic resin (water-soluble resin 4) of 100 as a dry paint film -- as -- spreading -- forming -- the conductor of a hybrid integrated circuit -- the section 5 was produced. Here, the acid number is the number of milligrams of a potassium hydroxide taken to neutralize the free fatty acid contained in organic resin.

[0018] thus, the conductor of the produced hybrid integrated circuit concerning this invention as shown in drawing 1 -- the laminating of the section 5 was carried out to aluminum plate with a thickness [of the base substrate 6] of 1.5mm through the insulating material layer 7 which consists of a silica content epoxy resin layer with a thickness of 100 micrometers, and the substrate for circuit formation of a configuration as shown in drawing 2 was produced.

[0019] The hybrid integrated circuit substrate as shown in drawing 5 using this substrate for circuit formation was produced. first, a conductor -- a resist is given to the water-soluble resin 4 formed on the circuit formation side aluminum foil 2 of the section 5 with screen printing, and pH dissolved both the

resin 4 and aluminum foils 2 that were exposed in the sodium-hydroxide water solution of 12, and exposed the Cu foil 1. After resist exfoliation, with Cu etching reagent, the exposed Cu foil 1 was removed, the resist was again given on the water-soluble resin 4 of the part which needs the aluminum circuit 8, the unnecessary aluminum foils 2 and 3 were alternatively removed in the sodium-hydroxide water solution, and the aluminum circuit 8 and the Cu circuit 9 were formed. Then, the water-soluble resin 4 on a resist and the aluminum circuit 8 is removed, a semi-conductor 11, a chip resistor, etc. are carried through solder 10 on the Cu circuit 9, and a semi-conductor 11 and the aluminum circuit 8 are fixed by the supersonic vibration technique with the aluminum lead wire 12.

[0020]

[Example 2] what rolled out the double layer foil which performed aluminum plating with a thickness of 5 micrometers, and was used as the Cu foil 1 with a thickness of 300 micrometers and the aluminum foil 2 with a thickness of 3 micrometers with electroplating to both sides of Cu foil with a thickness of 500 micrometers -- it is -- the conductor of the hybrid integrated circuit of this invention -- the hybrid integrated circuit substrate was produced by the completely same approach as an example 1 except having produced the section 5.

[0021]

[The example 1 of a comparison] the conductor of a hybrid integrated circuit -- the hybrid integrated circuit substrate was produced by the completely same approach as an example 1 except having not formed the water-soluble resin which dissolves in a with a pH of eight or more alkali water solution in aluminum foil 2 front face of the double layer foil which forms the section 5. Since this hybrid integrated circuit substrate did not have aluminum circuit in a desired part, its aluminum wire-bonding nature was poor.

[0022]

[The example 2 of a comparison] the conductor of a hybrid integrated circuit -- the hybrid integrated circuit substrate was produced by the completely same approach as an example 1 except having set to 50 micrometers thickness of the aluminum foil 2 of the double layer foil which forms the section 5. This hybrid integrated circuit substrate had poor aluminum wire-bonding nature by the part which needs 300 micrometers of circuit pattern width of face of the aluminum circuit 8.

[0023]

[Effect of the Invention] as having stated above -- this invention -- the conductor of a hybrid integrated circuit -- among the double layer foils of the Cu foil 1 and the aluminum foil 2 which form the section 5 By forming the water-soluble resin 4 which controls the thickness of the aluminum foil 2 and pH dissolves in eight or more alkali water solutions on the front face of the aluminum foil 2 It excelled in aluminum wire bonding nature, and it became possible to offer the conductor of the hybrid integrated circuit which can produce the hybrid integrated circuit substrate suitable for high density assembly.

[Translation done.]

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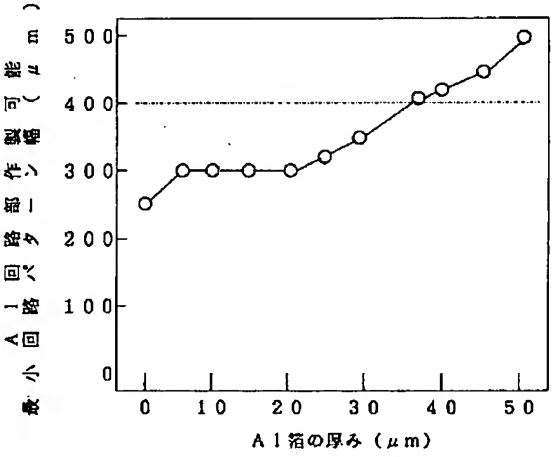
(54)【発明の名称】混成集積回路基板用導体

(57)【要約】
【目的】　Ａｌ箔とＣｕ箔との複層箔とからなるＡｌワイヤーボンデング性に優れ、かつ高密度実装可能な混成集積回路を作成できる混成集積回路用導体を提供する。
【構成】　金属基板に絶縁物層、ＣｕとＡｌとの複層箔とからなる導体部を順次積層して一体化してなる積層物の該箔を、エッチングして配線回路を形成させ、露出したＡｌ回路やＣｕ回路に半田を介してＣｕ回路と半導体や他部材とを積層し、かつ半導体とＡｌ回路とをＡｌリード線を用いて固着する混成集積回路において、ＣｕとＡｌとの複層箔でＡｌ／Ｃｕ／Ａｌの順に積層した導体部のＣｕ箔の厚みが９～１０００μｍ，Ａｌ箔の厚みが０．５～３０μｍの範囲で、いずれか一方のＡｌ箔表面側にｐＨ８以上のアルカリ性水溶液に対して容易に溶解する水可溶性樹脂を乾燥膜厚で０．５～１０μｍ形成したことを特徴とするＡｌワイヤーボンデイング性に優れた混成集積回路基板用導体に関する。



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【特許請求の範囲】

【請求項1】金属基板に絶縁物層、CuとAlとの複層箔とからなる導体部を順次積層して一体化してなる積層物の該箔を、エッチングして配線回路を形成させ、露出したAl回路やCu回路に半田を介してCu回路と半導体や他部材とを積層し、かつ半導体とAl回路とをAlリード線を用いて固着する混成集積回路において、CuとAlとの複層箔がAl／Cu／Alの順に形成した導体部で、Cu箔の厚みが9～1000μm，Al箔の厚みが0．5～30μmの範囲で、いずれか一方のAl箔表面側にpH8以上のアルカリ性水溶液に対して容易に溶解する水可溶性樹脂を乾燥膜厚で0．5～10μm形成したことを特徴とするAlワイヤーボンデイング性に優れた混成集積回路基板用導体。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、Alワイヤーボンデングおよび高密度実装性に優れた混成集積回路基板用導体に関する。

【0002】

【従来技術】従来、ワイヤーボンデングの機能を有する基板を製造するには、Cu箔を用いて回路形成を行い、その回路上に貴金属めっきもしくはNi等の卑金属めっきを施すか、またはCu箔上にAl片等のワイヤーボンデイングが可能な金属片を接合する必要があった。

【0003】しかしながら、貴金属めっきやNiめっきは高価であるだけでなく、均一なめっき面を得ることが難しく、ワイヤーボンデイング性能は不安定である。また、金属片の接合では数が多いと、回路形成作業が煩雑になるという問題があった。

【0004】一方、新しい方法として、特開昭58－48432号にみられるように、AlとCuとの複層箔を張り合わせた基板を用い、エッチングによりAlの回路を形成する方法が用いられてきている。このAlのボンデイングパットの特徴は、

（1）工程の途中で、めっきの必要がないこと。

（2）めっきによるボンデイングパットのように、めっき表面の精度や厚みを管理する必要がないこと。

（3）エッチングにより、再現性良く、一度に多数のAl回路を形成できること。

（4）Al線による超音波ボンデイングでは、AlとAlとの結合となるため、ボンデイングの作業範囲が広く、信頼性が高い。

等が挙げられる。

【0005】

【発明が解決しようとする課題】ところが、前記回路形成法にしたがってAlとCuとの複層箔で回路を形成した場合、Cu箔のエッチング時にAl箔部もエッチング液と接触することから、Al箔部に微小の欠陥部でも存在すると、そこに局部腐食が発生し、Al箔をとおして

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下層のCu箔までエッチングされてしまう。その結果、優れたAlワイヤーボンデイング性や平滑なCu回路が得られないという問題が生じる。このAl箔部の欠陥をAl箔の厚みで対応しようとすると、Al回路をアルカリエッチング液で形成する際に、サイドエッチングが激しくなり高密度実装に適したAl回路を形成することが困難になる。

【0006】将来的に、プリント配線基板はさらに、高集積化、高密度実装が要求され、回路には、より小さな導体幅、導体間隔が形成可能な導体箔が必要となる。そのため、Al箔はできる限り薄いものを用いてサイドエッチングの発生を抑え、かつCuエッチング液の接触によるAl箔部のエッチングも抑えられることが要求される。

【0007】本発明は、このような問題点を解決するため鋭意検討した結果、従来の回路形成方法でもAlワイヤーボンデイング性に優れ、かつ高密度実装を可能とした混成集積回路基板用導体を提供するものである。

【0008】

【課題を解決するための手段】本発明によれば、金属基板に絶縁物層、CuとAlとの複層箔とからなる導体部を順次積層して一体化してなる積層物の該箔を、エッチングして配線回路を形成させ、露出したAl回路やCu回路に半田を介してCu回路と半導体や他部材とを積層し、かつ半導体とAl回路とをAlリード線を用いて固着する混成集積回路において、CuとAlとの複層箔がAl／Cu／Alの順に形成した導体部で、Cu箔の厚みが9～1000μm，Al箔の厚みが0．5～30μmの範囲で、いずれか一方のAl箔表面側にpH8以上のアルカリ性水溶液に対して容易に溶解する水可溶性樹脂を乾燥膜厚で0．5～10μm形成したことを特徴とするAlワイヤーボンデイング性に優れた混成集積回路基板用導体が提供される。

【0009】

【作用】以下、図面により本発明を詳細に説明する。図1は本発明により、作製された混成集積回路基板における導体部の断面図を示す。Cu箔1の両面にAl箔を有した複層箔は導体部5であって、回路を形成する側のAl箔2の表面には、pH8以上のアルカリ性水溶液に対して容易に溶解する水可溶性樹脂4を積層し、他方のAl箔3側を絶縁物層7上に積層して用いる。

【0010】図2は、図1記載の本発明の導体部5を用いて、実際に回路形成用基板を作製したものの断面図である。Al板をベース基板6に、絶縁物層7の樹脂を積層し、その上に導体部5を積層する。このとき、回路形成と反対側のCu箔1の表面のAl箔3は導体部5と絶縁物層7との接合強度を向上させるためにあり、厚みは0．5μm以上あれば十分である。そして、Al箔3表面に陽極酸化処理によるAl酸化層を付与すれば、さらに効果がある。しかし、水可溶性樹脂4がAl箔3表面

にあると、導体部5と絶縁物層7との接合強度が得られないため、水可溶性樹脂4の形成は片面だけでよい。

【0011】本発明に用いるCu箔1とAl箔2との複層箔である導体部5の材質としては、Al、Cuともに高純度のものでも合金のものいずれでもよい。導体部5の作製方法としては、AlとCuの圧着クラッド法、Cuを被めっき体とした電気Alめっき法、または蒸着Alめっき法等があり、どの方法で作成したものでもよい。

【0012】本発明の導体部5におけるCu箔1の厚みは、9～1000μmが適用範囲であり、とくに大電流用途には、35～1000μmが好ましく、制御用の小電流用途には、9～70μmの箔厚が好ましい。

【0013】図3は、厚み300μmのCu箔1の両面に厚み5μmのAl箔を形成した導体部5を、ベース基板6と絶縁物層7とに張り合わせた後、従来の回路形成法に従って回路を形成したときのAl箔2の表面に塗布した水可溶性樹脂4の乾燥膜厚と、導体部のうちAl箔2のCuエッチング液に対する耐食性を調査したものである。Al箔2表面の水可溶性樹脂4を乾燥膜厚として0．5μm以上となるように塗布すると、Cuエッチング液に対するAl箔2の耐食性が向上する。また、水可溶性樹脂4の厚みが厚くなった場合には、Alワイヤーボンデイング性の低下が考えられるが、このような回路形成ではAlワイヤーボンデイングを施す前に、形成した回路上の洗浄を目的として、アルカリ脱脂またはバフ研磨を施すため、塗布する樹脂厚による不都合もなく、本来とくに上限は規定されない。しかしながら、経済的効果を考えると水可溶性樹脂4の乾燥膜厚は0．5～10μmで十分である。

【0014】本発明に用いられる水可溶性樹脂としては、酸性のCuエッチング液や雨水，水道水といった一般生活水等の接触による溶解を避けることができ、かつアルカリ性のエッチング液でAl回路を形成する際に、速やかにAlとともに溶解することが要求されるため、pHが8以上のアルカリ水溶液だけに溶解する水可溶性樹脂でなければならない。

【0015】図4は、厚み300μmのCu箔1両面に、厚み0．1～50μmの範囲でAl箔を形成した導体部5を、ベース基板6と絶縁物層7とに張り合わせた後、従来の回路形成法に従って回路を形成したときのAl箔の厚みと、Al回路8の作製可能な最小回路パターン幅および最小回路パターン間隔の関係について、Al箔2の表面に水可溶性樹脂4を乾燥膜厚として1μm形成して調査した結果を示す。なお、最小回路パターン幅，最小回路パターン間隔とは、プリント配線回路における高密度実装化の目安となるもので、従来のAlとCuとの複層箔ではAl回路8の作成可能な最小回路パターン幅ならびに最小回路パターン間隔は400μmよりも大きかった。また、ここでは最小回路パターン幅、最小回路パターン間隔ともほぼ同等の値を示したことから、最小回路パターン幅のみを示している。

【0016】図4からわかるように、Al箔2の厚みが30μmを越えると、Al回路8の作製可能な最小回路パターン幅を400μm以下にすることができない。また、水可溶性樹脂4を形成しても、Al箔2の厚みが0．5μm未満であると、良好なAlワイヤーボンデイング性を有するAl回路8を得ることができない。したがって、作製可能な最小回路パターン幅を400μm以下にして高密度実装化を実現するには、Al箔2の表面にpH8以上のアルカリ水溶液に溶解する水可溶性樹脂を乾燥膜厚で0．5μm以上形成して、Al箔2の厚みは0．5～30μmにすることが好ましい。

【0017】

【実施例1】以下、実施例により本発明を詳細に説明する。まず、厚み300μmの圧延Cu箔1の両面に電気めっき法で厚み5μmのAlめっきを施して、AlとCuとの複層箔を作製した。この複層箔の回路形成側に使用するAl箔2表面に、酸価が100のアクリル系樹脂（水可溶性樹脂4）を乾燥塗膜として1μmとなるように塗布、形成し、混成集積回路の導体部5を作製した。ここで、酸価とは、有機樹脂中に含まれる遊離脂肪酸を中和するのに要する水酸化カリウムのミリグラム数のことである。

【0018】このようにして作製した、図1に示すような本発明に係る混成集積回路の導体部5を、ベース基板6の厚さ1．5mmのAl板に、厚み100μmのシリカ含有エポキシ樹脂層からなる絶縁物層7を介して積層し、図2に示すような構成の回路形成用基板を作製した。

【0019】この回路形成用基板を用いて図5に示すような混成集積回路基板を作製した。まず、導体部5の回路形成側Al箔2上に形成した水可溶性樹脂4にスクリーン印刷法でレジストを施し、pHが12の水酸化ナトリウム水溶液で露出した樹脂4とAl箔2をともに溶解させ、Cu箔1を露出させた。レジスト剥離後、Cuエッチング液により、露出したCu箔1を取り除き、Al回路8を必要とする部分の水可溶性樹脂4上に再びレジストを施して、水酸化ナトリウム水溶液で選択的に不必要なAl箔2，3を取り除き、Al回路8およびCu回路9を形成した。その後、レジストおよびAl回路8上の水可溶性樹脂4を除去し、Cu回路9上に半田10を介して半導体11やチップ抵抗等を搭載し、半導体11とAl回路8とを、Alリード線12により超音波振動法で固着したものである。

【0020】

【実施例2】厚み500μmのCu箔の両面に電気めっき法で、厚み5μmのAlめっきを施した複層箔を圧延して、厚み300μmのCu箔1と厚み3μmのAl箔2にしたもので、本発明の混成集積回路の導体部5を作

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製した以外は、実施例1とまったく同様の方法で混成集積回路基板を作製した。

【0021】

【比較例1】混成集積回路の導体部5を形成する複層箔のAl箔2表面に、pH8以上のアルカリ水溶液に溶解する水可溶性樹脂を形成しなかった以外は、実施例1とまったく同様の方法で混成集積回路基板を作製した。この混成集積回路基板は所望の部位にAl回路がないため、Alワイヤーボンデイング性が不良であった。

【0022】

【比較例2】混成集積回路の導体部5を形成する複層箔のAl箔2の厚みを50μmとした以外は、実施例1とまったく同一の方法で混成集積回路基板を作製した。この混成集積回路基板は、Al回路8の回路パターン幅が300μm必要な部位で、Alワイヤーボンデイング性が不良であった。

【0023】

【発明の効果】以上述べたとおり、本発明は、混成集積回路の導体部5を形成するCu箔1とAl箔2との複層箔のうち、Al箔2の厚みを制御し、かつAl箔2の表面にpHが8以上のアルカリ水溶液に溶解する水可溶性樹脂4を形成することにより、Alワイヤーボンデング性に優れ、高密度実装に適した混成集積回路基板を作製できる混成集積回路の導体を提供することが可能となった。

【図面の簡単な説明】

【図1】本発明の混成集積回路の導体部の断面図を示す。

【図2】本発明の混成集積回路の導体部を用いた混成集積回路基板の断面図を示す。

【図3】厚み300μmのCu箔1両面に厚み5μmのAl箔を形成した複層箔の導体部5を用いて、回路を形成したときのAl箔2の表面に塗布した水可溶性樹脂4の塗膜厚とAl回路8のCuエッチング液に対する耐食性の関係を調査したものである。

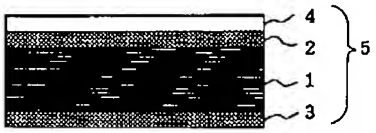
【図4】厚み300μmのCu箔1の両面に、Al箔を形成した複層箔の導体部5を用いて、回路を形成したときのAl箔の厚みと、Al回路8の作製可能な最小回路パターン幅および最小回路パターン間隔の関係を、Al箔2の表面に水可溶性樹脂4を1μm形成して調査したものである。

【図5】本発明の導体部5を積層した回路基板で回路を形成し、半導体を実装した混成集積回路基板の断面図である。

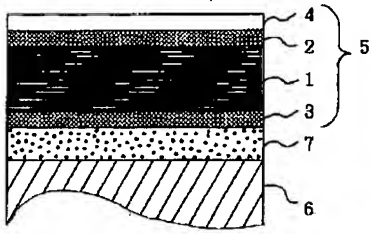
【符号の説明】

1　Cu箔
2　Al箔（回路形成側）
3　Al箔（絶縁物層との張り合わせ側）
4　水可溶性樹脂
5　導体部（AlとCuとの複層箔）
6　ベース基板
7　絶縁物層
8　Al回路
9　Cu回路
10　半田
11　半導体
12　Alリード線（ワイヤー）

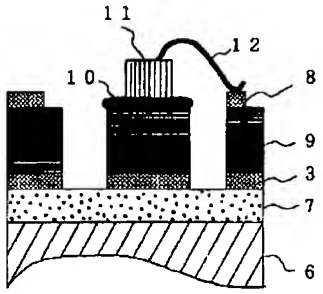
【図1】



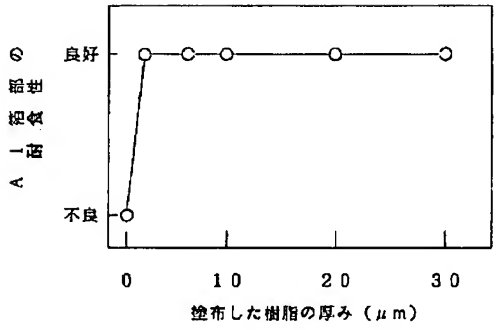
【図2】



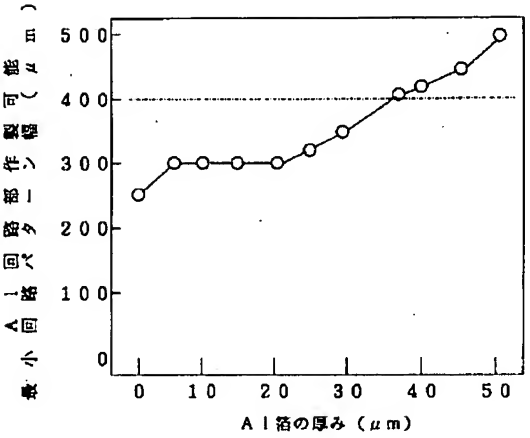
【図5】



【図3】



【図4】



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